

## APPENDIX A. DESCRIPTION OF COMMON DATABASE ELEMENTS

Standardized lookup tables and metadata tables provide consistency and integration among data sets as described in Section II of the Data Management Plan. The design views of shared lookup tables are depicted in Figures A-1 through A-6, and core metadata tables are depicted in Figures A-7 through A-10.

### 1. SHARED LOOKUP TABLES

**Figure A-1. Design of parks lookup table – a comprehensive list of NPS sites.**

tbl_Parks_LU : Table			
	Field Name	Data Type	Description
🔑	ParkCode	Text	4-character park code
	ParentParkCode	Text	4-character park code pointing to the parent park
	ParkName	Text	Park name
	Region	Text	NPS region
	ParkType	Text	Park type (National Park, National Monument, etc.)

**Figure A-2. Design of projects lookup table – information on project supervision, initiation dates, and types of data collected.**

tbl_Projects_LU : Table			
	Field Name	Data Type	Description
🔑	ProjectCode	Text	6-character code for the monitoring project
	ProjectTitle	Text	Full project title
	ProjectManager	Text	Individual in charge of monitoring project implementation
	StartDate	Date/Time	When monitoring project was initiated
	Comments	Text	Comments on the project
	DatabaseName	Text	Name of the data warehouse
	Format	Text	Type of database
	DatabasePath	Text	Directory path of database
	DataTypes	Text	Indicates types of data stored in the database

**Figure A-3. Design of species lookup table – a list of species observed and associated taxonomic information.**

tbl_Species_LU : Table			
	Field Name	Data Type	Description
🔑	RecordID	AutoNumber	Unique identifier of the record
	TSN	Number	ITIS taxonomic serial number
	TaxonCode	Text	Locally-unique code for taxa without an assigned TSN
	GroupCode	Number	Group of organisms of which this is a member: birds, fish, etc.
	ScientificName	Text	Scientific name of the taxon
	CommonName	Text	Common or vernacular name for the species
	ProvisionalID	Yes/No	Indicates that the species name represents a temporary identification which will be revised once the identity has been better resolved

**Figure A-4. Design of staff and cooperators table – a comprehensive list of staff, field workers, and cooperators.**

tbl_Staff&Cooperators_LU : Table			
	Field Name	Data Type	Description
	ObserverID	Text	Initials of observer
	Name	Text	Full name of observer
	Title	Text	Position title of observer
	Employer	Text	Employer of observer: default is NPS-PCLTEM
	GradeLevel	Text	GS level, or equivalent for non-federal employees

**Figure A-5. Design of cover class lookup table – cover classes for estimating percent cover within a defined area.**

tbl_CoverClasses_LU : Table			
	Field Name	Data Type	Description
	CoverClass	Text	Cover class for estimating percent cover in a defined area. The program standard is the modified Daubenmire 7-class scale, alternatives are Kelrick's scale described in the original protocol, and North Carolina Vegetation Survey's 10-class scale.
	NumericClass	Number	Numeric equivalent of the cover class, used for analysis of log-scaled data
	Range	Text	Range of cover values contained by each cover class
	MidpointValue	Number	Midpoint of the cover class range
	PC-LTEM_CoverClass	Number	Corresponding functional cover classes used to make data compatible with PC-LTEM data collected using the modified Daubenmire 7-class scale
	PC-LTEM_Range	Text	Corresponding range of cover values indicated by the functional cover class
	PC-LTEM_MidpointValue	Number	Corresponding midpoint of the functional cover class; original class midpoints were used for Kelrick's classes, where the original classes do not line up well with those of PC-LTEM

**Figure A-6. Design of habitat attribute lookup table – list of habitat attributes measured for various projects.**

tbl_HabitatAttributes_LU : Table			
	Field Name	Data Type	Description
	AttributeID	AutoNumber	Unique identifier for habitat attributes
	Attribute	Text	Habitat attribute being measured
	AttributeType	Text	Type of attribute being measured: ground cover, species groups, other
	Description	Text	Brief description of the habitat attribute

## 2. CORE METADATA TABLES

**Figure A-7. Design of locations metadata table – describes the sites where data collection occurs.**

	Field Name	Data Type	Description
	LocationID	Text	Unique identifier for the location, based partly on the park code and project code
	ParkCode	Text	4-character park code
	ProjectCode	Text	6-character code for the monitoring project (Birds, Plant communities, etc.)
	Description	Text	Location description
	StartUTMX	Number	UTM X (northing) coordinate for the center of the plot or location OR starting point of a line or polygon
	StartUTMY	Number	UTM Y (easting) coordinate for the center of the plot or location OR starting point of a line or polygon
	StopUTMX	Number	UTM X coordinate (northing) of ending point of line or polygon
	StopUTMY	Number	UTM Y coordinate (easting) of ending point of line or polygon
	UtmZone	Number	UTM zone
	StartLatitude	Number	Latitude in decimal degrees for the center of the plot or location OR starting point of a line or polygon
	StartLongitude	Number	Longitude in decimal degrees for the center of the plot or location OR starting point of a line or polygon
	StopLatitude	Number	Latitude in decimal degrees for the ending point of a line or polygon
	StopLongitude	Number	Longitude in decimal degrees for the ending point of a line or polygon
	Datum	Text	Datum of mapping ellipsoid
	EstimatedHorizontalError	Number	Estimated horizontal accuracy error--see users guide for complete details and examples
	AccuracyComments	Memo	Comments about how positional (horizontal) accuracy was estimated
	HabitatType	Text	Habitat type
	Elevation	Number	Elevation in meters
	Aspect	Number	Slope aspect in degrees (level surfaces have a value of -1)
	Slope	Number	Slope angle in degrees
	Azimuth	Number	Compass bearing between start and stop coordinates
	EstablishmentDate	Date/Time	Date site was established
	Discontinued	Date/Time	Date site was discontinued
	UnitName	Text	Management unit in which site is located
	PLP	Text	Indicates whether location is a point, line, or polygon

**Figure A-8. Design of sample periods metadata table – describes the time and duration of each data collection period.**

	Field Name	Data Type	Description
	PeriodID	Text	Unique identifier for the data collection period, based on the park code, project code, and start date of the sampling period
	ParkCode	Text	4-character park code
	ProjectCode	Text	6-character code for the monitoring project
	StartDate	Date/Time	Date when sampling began
	EndDate	Date/Time	Date when sampling ended
	TripReport	OLE Object	Trip report in MS Word format, describing protocol implementation details and special circumstances

**Figure A-9. Design of observers table – lists the observers for each sampling period.**

	Field Name	Data Type	Description
	PeriodID	Text	Unique identifier for the data collection period, based on the park code, project code, and start date of the sampling period
	ObserverID	Text	Initials of observer
	SamplingHours	Number	Hours spent in the field collecting data, in half-hour increments; excludes travel time
	NonsamplingHours	Number	Time spent during the collection period accomplishing project-specific tasks other than field data collection, in half-hour increments; excludes travel time

**Figure A-10. Design of sampling events metadata table – optional table describing the time and duration of each data collection event.**

tbl_SamplingEvents : Table			
	Field Name	Data Type	Description
?	PeriodID	Text	Unique identifier for the data collection period, based on the park code, project code, and start date of the sampling period
?	EventID	Text	Unique identifier for the sampling event, based on the park code, project code, start date and start time; sampling events are nested within a sampling period
	StartTime	Date/Time	Start time
	EndTime	Date/Time	End time
	StartDate	Date/Time	Date when sampling began
	EndDate	Date/Time	Date when sampling ended

## APPENDIX B. DESCRIPTION OF THE GRASSLAND PLANT COMMUNITY MONITORING PROTOCOL DATABASE

<b>Title:</b> Grassland Plant Communities	Protocol: Willson, G.D., L.P. Thomas, M.D. DeBacker, W.M. Rizzo and C. Buck. 2001. Plant community monitoring protocol for six prairie parks. Biological Resources Division, U.S. Geological Survey, prepared for Great Plains Prairie Cluster Long-Term Ecological Monitoring Program, Republic, MO.	<i>Project Manager:</i> Botanist (Mike DeBacker)
<p><u>Primary data sets:</u> Frequency and foliar cover of herbaceous and shrub species; number and size of woody species; density of seedlings and saplings</p> <p><u>Habitat/Environmental data:</u> Slope and aspect of sample sites, ground cover of bare soil, exposed rock, leaf litter, etc.</p> <p><u>Status:</u> Implemented at AGFO, EFMO, HOME, PIPE, SCBL, TAPR, WICR</p> <p><u>Legacy data sets:</u></p>		

Plant Community monitoring has three main components:

- Plant community diversity, composition and structure are monitored through the periodic recording of herbaceous and shrub species occurrences and foliar cover in plots located along permanent transects.
- Density of the woodland overstory is measured using a spherical densiometer, and regeneration of tree species is measured through counts of seedling and saplings
- Habitat variables are important in explaining spatial heterogeneity, and as correlates to trends in the plant community. Slope and aspect are recorded for each plot and the ground cover of bare soil, exposed rock, leaf litter, etc. is estimated.

### 1. DATABASE STRUCTURE

The plant community monitoring database comprises three primary data tables, two plant attribute tables and core metadata and lookup tables. The occurrence and foliar cover of plant species observed in each plot are recorded in tbl\_VegMonData. Canopy cover, measured as the number of points covered by a reflection of canopy vegetation using a spherical densiometer, is recorded in tbl\_CanopyCover. Finally, the number of tree seedlings and saplings counted is recorded in tbl\_Regeneration. Certain data summaries require species attributes (e.g. native/exotic, shrub/herbaceous plant). Attribute data regarding taxonomy, life history and growth pattern are stored in tbl\_PlantAttributes\_LU. Further, each species is assigned to a functional guild in tbl\_SpeciesWithGuilds for use in summaries (e.g. relative frequency and cover of warm season grasses, spring flowering forbs, etc.). Figure B-1 shows the relationship among tables in the plant community monitoring database. Figures B-2 through B-6 show the fields composing the five protocol specific data tables.



Figure B-1. Plant Community Monitoring Database Structure

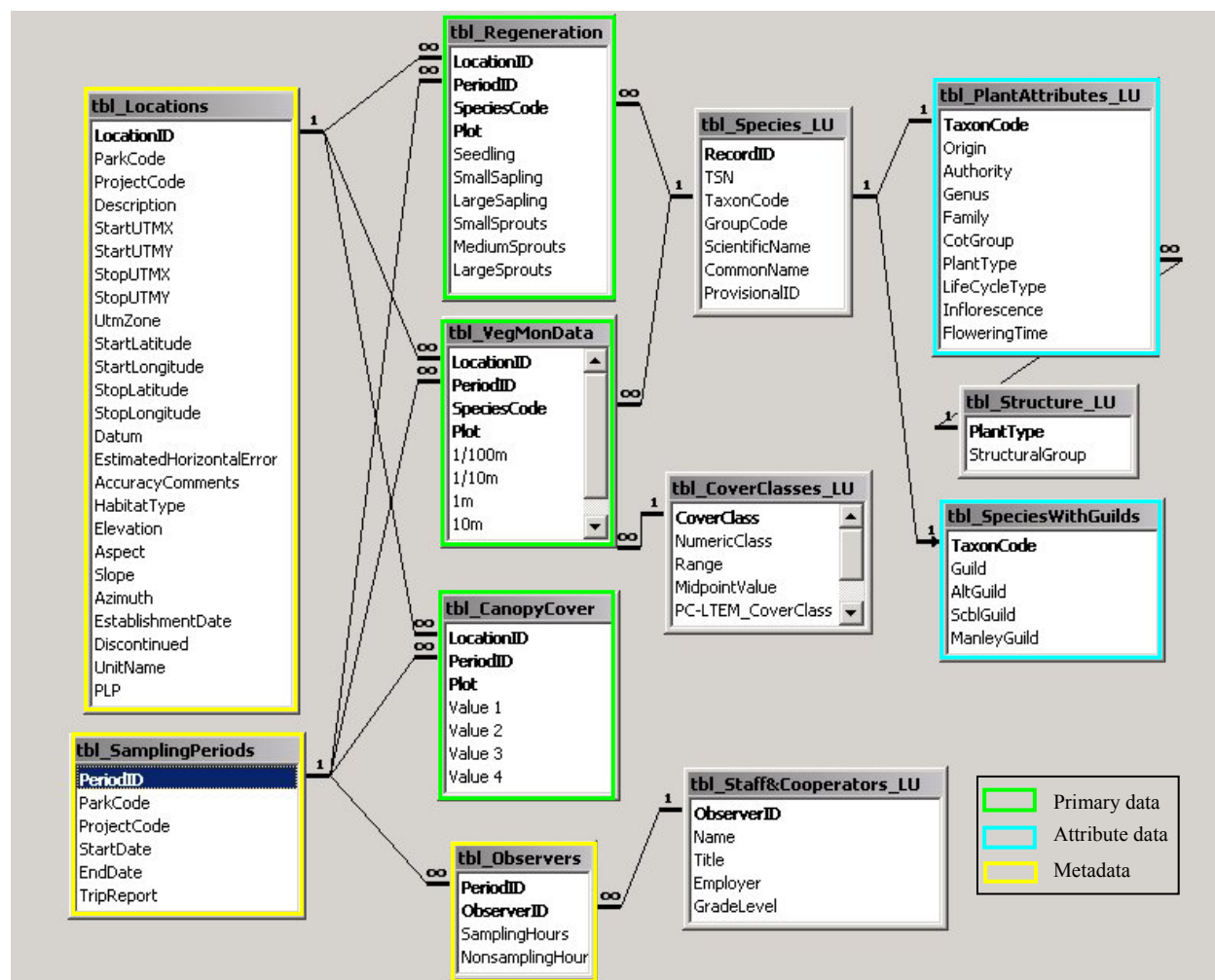


Figure B-2. Design of vegetation monitoring data table – list by site the species observed and their foliar cover.

tbl_VegMonData : Table			
	Field Name	Data Type	Description
	LocationID	Text	Unique identifier for the location, based partly on the park code and project code
	PeriodID	Text	Unique identifier for the data collection period, based on the park code, project code, and start date of the sampling period
	SpeciesCode	Text	Locally-unique code for taxa without an assigned TSN
	Plot	Text	Unique identifier for each plot at that location (usually 10)
	1/100m	Number	Presence/absence of species in 1/100m nested subplot. Present = -1
	1/10m	Number	Presence/absence of species in 1/10m nested subplot. Present = -1
	1m	Number	Presence/absence of species in 1m nested subplot. Present = -1
	10m	Number	Presence/absence of species in 10m plot. Present = -1
	Cover	Text	Foliar cover class for the species at the 10m scale using Modified Daubenmeier cover classes, values range from 1 to 7

**Figure B-3. Design of overstory canopy cover data table – describes the canopy density.**

tbl_CanopyCover : Table			
	Field Name	Data Type	Description
	LocationID	Text	Unique identifier for the location, based partly on the park code and project code
	PeriodID	Text	Unique identifier for the data collection period, based on the park code, project code, and start date of the sampling period
	Plot	Text	Unique identifier for each plot at that location (usually 10)
	Value 1	Number	Number of points covered by a reflection of canopy vegetation out of a possible 96 using a sperical densiometer
	Value 2	Number	Number of points covered by a reflection of canopy vegetation out of a possible 96 using a sperical densiometer
	Value 3	Number	Number of points covered by a reflection of canopy vegetation out of a possible 96 using a sperical densiometer
	Value 4	Number	Number of points covered by a reflection of canopy vegetation out of a possible 96 using a sperical densiometer

**Figure B-4. Design of the tree regeneration data table – list the number of tree species observed in various size classes.**

tbl_Regeneration : Table			
	Field Name	Data Type	Description
	LocationID	Text	Unique identifier for the location, based partly on the park code and project code
	PeriodID	Text	Unique identifier for the data collection period, based on the park code, project code, and start date of the sampling period
	SpeciesCode	Text	Locally-unique code for taxa without an assigned TSN
	Plot	Text	Unique identifier for each plot at that location (usually 10)
	Seedling	Number	Tally of seedlings (i.e. < 0.5m tall)
	SmallSapling	Number	Tally of small saplings (i.e. > 0.5m tall, < 2.5 cm dbh)
	LargeSapling	Number	Tally of large saplings (i.e. > 2.5 cm dbh, < 5.0 cm dbh)
	SmallSprouts	Number	Tally of small sprouts (i.e. < 0.5m tall) - sprouts originating from stumps
	MediumSprouts	Number	Tally of medium sprouts (i.e. > 0.5m tall, < 2.5 cm dbh) - sprouts originating from stumps
	LargeSprouts	Number	Tally of large sprouts (i.e. > 2.5 cm dbh, < 5.0 cm dbh) - sprouts originating from stumps

**Figure B-5. Design of plant attributes lookup table – describes the taxonomy, life history and growth patterns of each species.**

tbl_PlantAttributes_LU : Table			
	Field Name	Data Type	Description
	TaxonCode	Text	Locally-unique code for taxa without an assigned TSN
	Origin	Text	Native/Introduced
	Authority	Text	Taxonomic authority
	Genus	Text	Taxonomic genus
	Family	Text	Taxonomic family
	CotGroup	Text	Dicot/Monocot/Gymnosperm/Pteridophyte
	PlantType	Text	aquatic/aquatic grass/ aquatic grass-like/fern/grass/grass-like/herb/he
	LifeCycleType	Text	Annual/Biennial/AB/AP/BP/Deciduous Perennial/Evergreen Perennial
	Inflorescence	Text	Determinate/Indeterminate
	FloweringTime	Text	Usual flowering period

**Figure B-6. Design of species guilds table – groups all species into functional guilds.**

tbl_SpeciesWithGuilds : Table			
	Field Name	Data Type	Description
	TaxonCode	Text	Locally-unique code for taxa without an assigned TSN
	Guild	Text	Primary functional guild
	AltGuild	Text	Secondary functional guild
	ScblGuild	Text	Guild designations for analysis of Scotts Bluff prairie restoration
	ManleyGuild	Text	Guild designations for analysis of Wilson's Creek NB savanna restoration

## 2. DATA ENTRY

Data entry is initiated through the 'VegDataEntry' form (Figure B-7). For each species in a sample plot, the user selects sample period, location, plot and species name from pick lists. Pick list values are limited to records in the sample periods, locations and species tables. Next, a cover class code is selected from a list of valid numbers, and scale is selected by checking the appropriate box. When entering multiple species from a single plot, the copy button populates the periods, location and plot fields from the previous record. If a species is unknown, the 'species unknown' button opens a form to create a temporary unknown code.

If a species name does not appear in the pick list, either the species is a new occurrence for the park, or an alternative name is used for that species. Synonyms (i.e. two or more different names referring to the same taxon) are common for plant species. The nomenclature update form (Figure B-8), accessed via the 'species synonymy' button, searches for synonyms. Synonymy data are from the USDA PLANTS database. In the form, if the second field contains a common name, the species name is valid and should be added to the species table via the 'enter new species' button (Figure B-9). If the second field begins with an equal sign followed by a different scientific name, then the user should use the new name when entering the species.

**Figure B-7. Plant community monitoring data entry form.**

The screenshot shows the 'frm\_VegDataEntry : Form' interface. It includes several pick lists for 'Period ID' (SCBL\_VegMon\_2000-Jun-09), 'Location ID' (SCBL\_VegMon\_9), and 'Plot' (30A). A 'Copy' button is next to the 'Enter New Period' button. The 'Cover' field is set to 1, and scale checkboxes for 1/100m, 1/10m, 1m, and 10m are shown, with 10m selected. The 'Species' field contains 'ZIGADENUS VENENOSUS VAR. GRAMINEUS'. Below this are fields for 'Authority' (Rydb.) Walsh ex M.E., 'Genus' (Zigadenus), and 'Family' (Liliaceae). Buttons for 'Species Synonymy' and 'Species Unknown' are on the right. At the bottom, a record navigation bar shows 'Record: 86905 of 86905'. Annotations with leader lines point to various parts of the form:

- Pick lists to choose location, sampling period and plot**: Points to the Period ID, Location ID, and Plot pick lists.
- Enter new sampling period information (e.g. when, who) before selecting the period from the pick list.**: Points to the 'Enter New Period' button.
- Search database for synonymous species names and confirm the correct species nomenclature**: Points to the 'Species Synonymy' button.
- Enter species name. Values are limited to a standardized list of accepted names (i.e., ITIS) to ensure consistency and prevent duplicate entry of synonyms.**: Points to the 'Species' pick list.
- Enter a temporary code to track**: Points to the 'Species Unknown' button.



**Figure B-8. Species synonymy lookup form.**

A scientific name not found in the species pick list.

Scientific Name:   
 common name, or = new name:   
 Family:   
 Acronym:   
 Enter New Species  
 Record:   5   of 13430

Unique code to identify species

The alternative name, *Tripterocalyx micranthus* should be used when entering data for this taxa into the database. (Note: field begins with “=”).

**Figure B-9. New species information data form.**

Species, common name, family and species code automatically populated from synonymy look-up form

Species:   
 Authority:   
 Common name:   
 Family:   
 Genus:   
 Taxon code:  PLANTS acronym  
 Origin:  N = Native, I = Introduced  
 Return to Data Entry Form  
 Record:   1033   of 1033

Unique identifier based on USDA PLANTS acronym

### 3. DATA SUMMARY AND REPORTING

Plant community summary reports are automated in the database, thus eliminating potential error through the many ‘cut and paste’ operations required when summarizing in a spreadsheet and greatly improving reporting efficiency. Through a series of queries, data from the two sample periods per year are combined to create the following annual reports:

- Plant community composition – Shannon diversity and evenness
- Plant community composition – Relative frequency and cover of plant guilds
- Frequency, mean cover and importance value for all species
- Frequency, mean cover and importance value for exotic species
- Plant community summary – Relative frequency and cover of exotic species
- Plant community structure – Ground cover and vegetation type cover

An automated series of reports can be launched by running the macro, mcr\_SummaryReports. The query, qryfil\_CombinePeriods, determines the set of data to be included in the summary through criteria set by the user (Figure B10). Open the query in design view to set criteria. Location criteria are set in the LocationID field. For a summary of multiple monitoring sites, “or” is used to link multiple criteria. For example, like “Wicr\_VegMon\_1” or like “Wicr\_VegMon2.” The previous criteria can be abbreviated using the wildcard symbol (\*), for example, “Wicr\*1” or like “Wicr\*2.”

Figure B10. Design view of qryfil\_CombinePeriods showing selection criteria for reports.

